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Van Hell, E.A.; Kuks, J.B.; Borleffs, J.C.; Cohen-Schotanus, J.

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WEB PAPER

Alternating skills training and clerkships to ease the transition from preclinical to clinical training

ELISABETH A. VAN HELL, JAN B. M. KUKS, JAN C. C. BORLEFFS & JANKE COHEN-SCHOTANUS

University of Groningen and University Medical Center Groningen, The Netherlands

Abstract

Background: The transition from preclinical to clinical training is perceived as stressful with a high workload being the main difficulty. To ease this transition, we implemented a dual learning year, where just-in-time skills training and clerkships alternated.

Aims: To examine the effect of the dual learning year on students' stress and perceptions of workload and skills level, and to compare these data with a baseline measurement from a curriculum in which skills training was provided in advance of clerkships.

Method: During the first Master year, students completed four rotations in which 5 weeks of skills training and 5-week clerkships alternated. In the second clerkship week of each rotation, students ($n=476$) completed questionnaires measuring their experienced workload, perceived skills level and stress. Analysis of variance was used for trend analysis and to determine differences with the baseline measurement ($n=83$).

Results: During the dual learning year, 'experienced workload' decreased ($F(1,471)=9.408$, $p < 0.01$), 'perceived skills level' increased ($F(1,471)=94.202$, $p < 0.001$) and stress decreased ($F(1,471)=3.309$, $p < 0.10$). 'Experienced workload' was lower ($F(5,553)=7.599$, $p < 0.001$) and 'perceived skills level' was comparable to the baseline measurement.

Conclusions: Compared to the baseline measurement and the results of earlier studies on transition difficulties, alternating just-in-time skills training and clerkships seem to ease the transition from preclinical to clinical training.

Introduction

The transition from preclinical to clinical training is a difficult period for medical students (Alexander & Haldane 1979; Walker et al. 1981; Firth 1986; Moss & McManus 1992; Prince et al. 2000; Teunissen & Westerman 2011). During the transition, students experience feelings of stress, and recent research shows that students perceive a high workload to be one of the main transition difficulties (Radcliffe & Lester 2003; Hayes et al. 2004; Seabrook 2004; Prince et al. 2005). In this study, we compare a dual learning year in which skills training and clerkships alternate to a baseline measurement from a curriculum in which all skills training was offered in the years preceding the clerkships. We examined whether the dual learning year decreased the workload students experienced and students' feelings of stress. Furthermore, we analysed if the rearrangement of skills training was not at the cost of students' perceptions of their level of skills.

In medical education, the start of clinical training is one of the main causes of student stress (Alexander & Haldane 1979; Walker et al. 1981; Radcliffe & Lester 2003). During preclinical training, students learn in an environment where the main focus is on student learning, whereas in a clinical environment, the main focus is on patient care. Students look forward to their clinical training period, and real patient contacts motivate them to learn. However, they experience the start of their clinical training as rather daunting and stressful (Prince et al. 2000; Seabrook 2004). Students report difficulties with their

Practice points

- In a dual learning year, periods of just-in-time skills training in an educational environment and periods of clerkships in a workplace environment alternate.
- In a curriculum where all skills training is provided prior to the clerkships, students experience more transition difficulties concerning high workload than in case of a dual learning year.
- The dual learning year decreases the workload students experience, while this is not at the cost of students' perceptions of their level of skills.
- Alternating skills training and clerkships may ease the transition from preclinical to clinical training.

new roles, the high work pressure and feelings of inadequacy while carrying out simple practical procedures (Firth 1986; Moss & McManus 1992; Prince et al. 2000; Radcliffe & Lester 2003). More recently, it was found that the main factor of transition difficulty is an experienced high workload (van Hell et al. 2008), which might negatively influence student learning. Subsequently, the need for a new instructional model for clerkship learning was put forward (van Hell et al. 2008). The main aim of such a model should be to ease the transition from preclinical to clinical training and in particular to decrease the workload students experience during the transition.

Correspondence: E. A. van Hell, Center for Research and Innovation in Medical Education, University of Groningen and University Medical Center Groningen, A. Deusinglaan 1, 9713 AV Groningen, The Netherlands. Tel: 00 31 50 363 7349; fax: 00 31 50 363 7390; email: E.A.van.Hell@med.umcg.nl

The importance of the transition from preclinical to clinical training is reflected in the development and implementation of various curriculum innovations. Basic and clinical sciences are now more and more integrated throughout the whole curriculum, the focus of education has shifted from the acquisition of knowledge to the achievement of competences and many medical schools have changed their traditional curricula to Problem-Based Learning curricula (Rabinowitz et al. 2001; Small & Suter 2002). Many changes are focused on professional skills and communication training, medical skills laboratory and transitional courses, ranging from 1 day to 1 week long. (van Dalen et al. 2002; Mainhard et al. 2004; Peeraer et al. 2007; Poncelet & O'Brien 2008). Several universities chose to implement a transitional clerkship to facilitate the transition to the clinical environment (Jacobs et al. 2005; Chittenden et al. 2009).

Difficulties concerning the transition from learning in an educational environment to learning in a workplace environment are not unique to medical education. Comparable transition problems were found in educational programmes for social work, physiotherapy and occupational therapy (Elliott 1991; Eraut 2000; Le Maistre & Paré 2004). It was suggested that dual learning – in which students move back and forth between the educational and workplace environments – might decrease transition problems (Le Maistre & Paré 2004). In an attempt to explain transition difficulties theoretically, Nicholson (1984) developed his theory of 'work role transitions'. Later on, his theory was simplified to four phases individuals experience when going through a transition: the preparation phase, the encounter phase, the adjustment phase and the stabilisation phase. In undergraduate medical education, the preparation phase is represented by the preclinical training period, which is followed by the first months in clinical clerkships (encounter phase), after which the adjustment and stabilisation phases take place.

To facilitate the transition from preclinical to clinical training and particularly decrease the workload students experience, we developed a dual learning year with just-in-time skills training. In this dual learning year, we integrated the preparation and encounter phases from Nicholson's (1984) theory of 'work role transitions'. During the dual learning year, training periods in an educational environment (skills training) and a workplace environment (clerkships) alternate. Student skills training is organised and structured in such a way that students learn new skills right before having to apply them in a real clinical setting. The new skills are learnt in a safe environment, where the level of support is decreased gradually and students receive just-in-time information and personal feedback (Janssen-Noordman et al. 2006). During the subsequent clerkship period, students apply the skills they acquired in the training period and gain the necessary experience in a clinical setting (Le Maistre & Paré 2004). After finishing a clerkship, students start the next skills training period. At the start of this training period, students reflect on their previous clerkship experience and identify personal learning needs. Subsequently, they focus their training on these learning needs in the educational environment. Furthermore, the students learn new skills to prepare them for their next clerkship.

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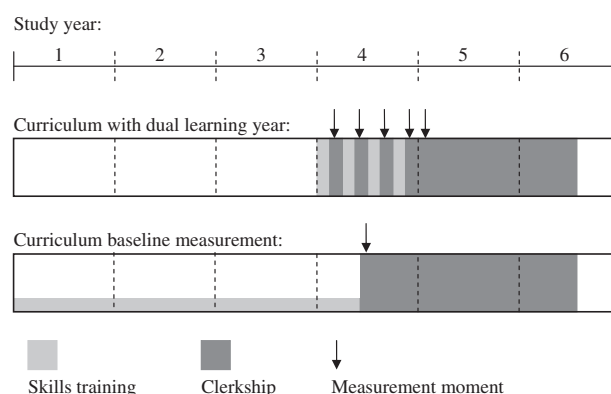


Figure 1. Overview of curricula and measurement moments.

Throughout the dual learning year, skills training and clerkships alternate, resulting in four skills training periods, each followed by a clerkship. The students thus experience four mini-transitions from skills training periods to subsequent clerkships, instead of one major transition from preclinical training to clerkships (Figure 1). The aim of this instructional model for clerkship learning is to ease the transition by decreasing the workload students experience during the transition. Consequently, we hypothesised:

- (1) In a dual learning year in which skills training and clinical clerkships alternate, the workload students experience (a) decreases throughout the mini-transitions and (b) is less than that of students whose transition occurs in a curriculum where all skills training is provided before the clerkships.

An additional consequence of the dual learning year is that students have only received limited skills training when they start their first clerkships. Only after completion of the dual learning year, these students have received as much skills training as students whose transition occurs in a curriculum, where all skills training is provided before the clerkships. To analyse if the rearrangement of skills training was not at the cost of students' perceptions of their level of skills, we tested the following hypotheses:

- (2) (a) In a dual learning year in which skills training and clinical clerkships alternate, the skills level students perceive increases throughout the mini-transitions. (b) At the beginning of the year it has an acceptable level and at the end of the year it is comparable to that of students whose transition occurs in a curriculum where all skills training is provided before the clerkships.

When comparing the students' stress to the results of previous studies in medical education, our aim was to obtain an overall measure of student stress during the mini-transitions. Since this measure had not been included in the baseline measurement, statistical comparison to a previous curriculum was not possible. We expected that:

- (3) In a dual learning year in which skills training and clerkships alternate, student stress decreases

Table 1. Four junior rotations and the corresponding medical specialties.

A	B	C	D
Rehabilitation	Internal medicine	Surgery	Obstetrics/
Orthopaedics	Pulmonary	Ear, nose and throat	Gynaecology
Rheumatology	Endocrinology	Oncology	Paediatrics
Neurology	Cardiology		Urology
Psychiatry	Dermatology		
Ophthalmology			

throughout the mini-transitions and remains at an acceptable level.

Methods

Context

Dual learning year. The undergraduate curriculum of the University of Groningen in the Netherlands consists of a 3-year Bachelor's and a 3-year Master's programme. The Bachelor's programme includes competence-based and patient-centred education with limited skills training, and comprises 10-week blocks which are 12 in number. Each week of the programme has a main theme and starts with a lecture addressing a patient's problem. The teacher interviews a real patient with a problem related to the theme of the week. Subsequently, the students are invited to ask the teacher and the patient questions to gain more insight into the patient's problem. In 8 of the 12 blocks, students participate in tutorial groups, where they elaborate on the patient's problem and work on three written assignments about related patient problems. During the other four blocks, students attend lectures and clinical reasoning sessions. In addition, the students accompany a general practitioner, a medical specialist and a public health officer, during 2 days each. Furthermore, students carry out several patient interviews and reflect on these conversations.

Dual learning is implemented in the first Master year, in which skills training and clerkships alternate (Figure 1). This dual learning year comprises four junior rotations (A–D). Each rotation lasts 11 weeks, starting with 1 week of training in general medical consultation skills, followed by 4 weeks of rotation-related skills training – both at the university skills training centre – and 1 week of exams. All junior rotations end with a 5-week clerkship in a medical specialty related to the specific rotation (Table 1). Consequently, students experience a mini-transition at each junior rotation. To use the capacity of the university hospital efficiently, students start in either rotation A, B, C or D and pass through the junior rotations in random order. Therefore, some of the students experience their first mini-transition in rotation A and others in rotations B, C or D. The same applies to the second, third and fourth mini-transitions. The clerkship supervisors from all disciplines have been previously trained; so, they are well informed of the required levels of competence and students' roles and responsibilities during junior rotations. During junior rotations, the main focus is on general consultation skills. Students are

involved in daily medical practice on clinical wards and outpatient consultations under continuous supervision of clinical staff. The students perform a wide range of duties such as attending meetings (morning reports and pathology meetings) and ward rounds, and participating in ambulatory care. Furthermore, students take medical histories of patients, compile medical records and perform simple medical procedures such as taking blood.

During the second Master year, students rotate through senior clerkships at affiliated hospitals, and have more responsibilities than in the junior rotations. The curriculum ends with the third Master year comprising a 6-month clinical training period and 6 months of scientific research training.

Baseline measurement. The baseline measurement was taken from the previous 6-year, problem-based and patient-centred curriculum at the same university (van Hell et al. 2008). The third trimester included a 2-week internship in a nursing department and the 10th trimester a 2-week training period in a general practice. In this curriculum, preparatory clinical skills were learnt over 10 trimesters preceding the clerkships. After this preclinical period, students took part in clerkships at the university hospital and affiliated hospitals. Consequently, the students who participated in the baseline measurement experienced only one major transition (Figure 1). The clinical training period neither included a general introductory course or a transitional clerkship nor training in a skills lab. Students' role during the clerkships of both the previous and the current curriculum is similar. The students have to perform the same duties and have the same responsibilities. A more extensive method description of the baseline measurement can be found in a previous study (van Hell et al. 2008).

Participants and procedure

We used a balanced cross-sectional design in this study. This means that students who participated in the dual learning year were distributed evenly across the four mini-transitions and participated only once in our study. The participants were students in their first (129), second (86), third (74) or fourth (100) mini-transitions in the dual learning year, or students at the start of their senior clerkships in the second Master year (87). The participants who took part in the dual learning year were distributed evenly across the junior rotations A (91), B (95), C (121) and D (82). The participants for the baseline measurement were 83 students in the first clerkship of the previous curriculum. All participants were asked to complete questionnaires in the second week of their clerkships. Students were informed about the purpose of the study. Participation was voluntary and anonymity was guaranteed.

Instruments

Experienced workload and perceived skills level. The workload students experienced and students' perceptions of their level of skills were measured by the scales 'appropriate workload' and 'have enough [patient contact] skills' from the transition questionnaire of Prince et al. (2005) modified by

Table 2. Mean scores and standard deviations experienced workload (1 = low workload and 5 = high workload), perceived skills level (1 = low skills level and 5 = high skills level) and GHQ-12 score.

	1st junior rotation	2nd junior rotation	3rd junior rotation	4th junior rotation	1st senior clerkship	F/χ^2
Experienced workload						
Mean (SD)	2.97 (0.66)	2.74 (0.66)	2.78 (0.81)	2.69 (0.74)	2.65 (0.76)	3.515*
Perceived skills level						
Mean (SD)	3.39 (0.40)	3.60 (0.42)	3.73 (0.42)	3.88 (0.37)	3.86 (0.38)	28.701**
GHQ-12						
Mean (SD)	2.25 (2.36)	1.73 (1.92)	2.47 (2.62)	1.96 (2.80)	1.45 (2.20)	2.471***
% cases	23.3	15.1	25.7	20.0	13.8	5.757

Notes: SD = standard deviation.

* $p < 0.01$; ** $p < 0.001$; and *** $p < 0.05$.

Van Hell et al. (2008). From both scales, we omitted one item irrelevant for the dual learning year. Consequently, the new scale 'experienced workload' consisted of 4 items and the scale 'perceived skills level' of 12 items. The items had to be scored on a five-point Likert scale. A scale score was obtained by calculating the mean of the items. Negatively worded items were reverse coded in such a way that the scale 'experienced workload' runs from 1 = low workload to 5 = high workload and the scale 'perceived skills level' from 1 = low skills level to 5 = high skills level. In the baseline measurement, the original scales were found to be reliable with α values 0.70 and 0.83, respectively (van Hell et al. 2008).

Stress. To measure students' stress, the Dutch version of the General Health Questionnaire with 12 items (GHQ-12) was used. The GHQ-12 was scored using the standard 0-0-1-1 method for each item, which allows a maximum score of 12 (Koeter & Ormel 1991; Goldberg et al. 1997). The threshold score indicating psychiatric morbidity (a so-called case) is dependent on the research population (Koeter & Ormel 1991). To enable comparison with other medical education programmes, we considered a threshold score of ≥ 4 to represent a 'case'. Student stress was not measured as part of the baseline measurement.

Statistical analysis

Reliability coefficients (Cronbach's α) were determined for all three measurements. To check the validity of the measurements, Pearson correlations were performed to analyse the relationship between the workload students experienced, students' perceptions of their level of skills and students' stress. The mean scores and standard deviations were calculated for experienced workload, perceived skills level and GHQ-12 scores. This was done for the whole sample of participants and for the gender, mini-transition and junior rotation subgroups. In the same way, the percentage of students scoring above threshold in the GHQ-12 was calculated. Chi-square tests were used to analyse differences in GHQ-12 threshold percentages. *T*-tests and analyses of variance (ANOVAs) were performed to analyse differences in experienced workload, perceived skills level and GHQ-12 scores and to determine linear trends as the students progressed through the mini-transitions. Finally, we analysed differences in experienced workload and perceived skills level

between the scores per mini-transition on the one hand and the baseline measurement on the other hand by means of ANOVAs with *post hoc* Bonferroni.

Results

Of the 549 students in the dual learning year, 476 (87%) completed the questionnaires. Of these respondents, 74% were female and 25% male, which is representative of the gender distribution of medical students at the university under study (three respondents did not indicate their gender). The Cronbach's α values were 0.66 for experienced workload, 0.78 for perceived skills level and 0.80 for the GHQ-12. Significant correlations were found between experienced workload and perceived skills level ($r = -0.297$, $p < 0.01$), between experienced workload and stress ($r = 0.367$, $p < 0.01$) and between perceived skills level and stress ($r = -0.266$, $p < 0.01$).

Experienced workload

Overall, the students in the dual learning year were moderately satisfied with the workload they experienced (mean = 2.78, SD = 0.73). Females scored significantly higher on experienced workload than males (2.83 against 2.66, $t(471) = -2.239$, $p < 0.05$). Mini-transitions differed significantly with respect to experienced workload ($F(4,471) = 3.515$, $p < 0.01$), and experienced workload decreased as students progressed through the mini-transitions ($F(1,471) = 9.408$, $p < 0.01$) (Table 2 and Figure 2).

The baseline measurement showed that students experienced considerable workload (mean = 3.20, SD = 0.69) during their transition. Compared to this measurement, students in the second, third and fourth junior rotations of the dual learning year or at the start of the first senior clerkship experienced significantly less workload ($F(5,553) = 7.599$, $p < 0.001$).

Perceived skills level

Students in the dual learning year perceived a relatively high level of skills (mean = 3.67, SD = 0.44). Females scored significantly lower on perceived skills level than males (3.62 against 3.81, $t(471) = 4.198$, $p < 0.001$). Mini-transitions differed significantly with respect to perceived skills level ($F(4,471) = 28.701$, $p < 0.001$), and perceived skills level

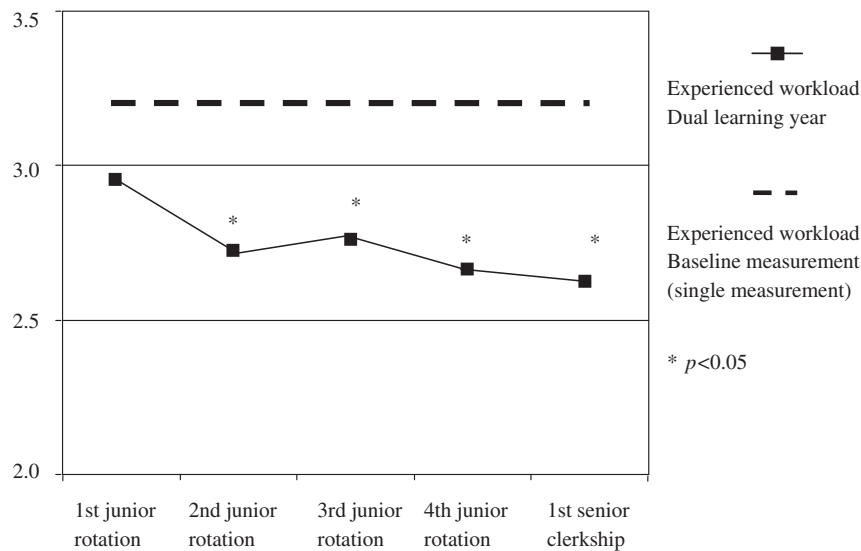


Figure 2. Mean scores for experienced workload. Dual learning year, divided into mini-transitions and baseline measurement.

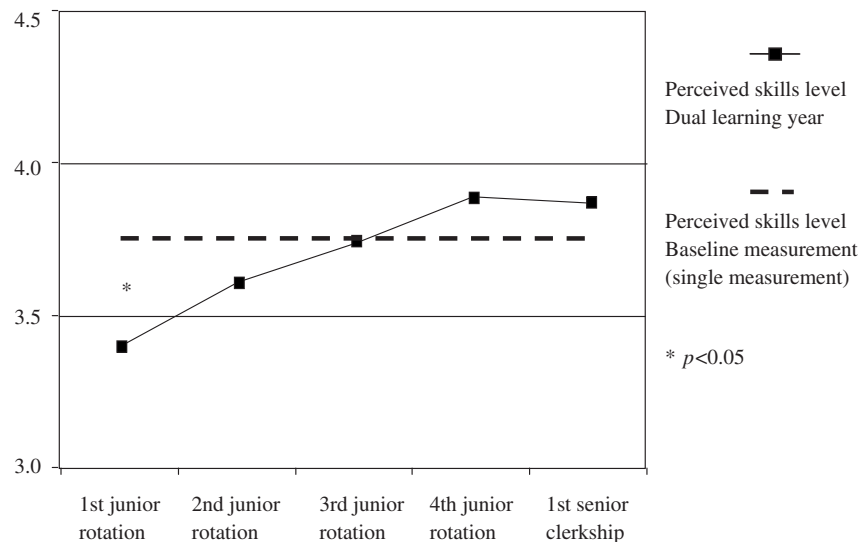


Figure 3. Mean scores for perceived skills level. Dual learning year, divided into mini-transitions and baseline measurement.

increased as students progressed through the mini-transitions ($F(1,471) = 94.202$, $p < 0.001$) (Table 2 and Figure 3).

Students who participated in the baseline measurement perceived a relatively high level of skills during the transition (mean = 3.73, SD = 0.48). Compared to the baseline measurement, students in the first junior rotation of the dual learning year perceived a significantly lower level of skills ($F(5,553) = 21.771$, $p < 0.001$). Students in the second, third and fourth junior rotations of the dual learning year or at the start of the first senior clerkship did not differ significantly from students who participated in the baseline measurement.

Stress

Overall, students in the dual learning year had a mean GHQ-12 score of 1.98 (SD = 2.42) and 19.7% of all students scored

above the GHQ-12 threshold. Females scored significantly higher on the GHQ-12 than males (2.15 against 1.51, $t(274.15) = -2.860$, $p < 0.01$). Mini-transitions differed significantly with respect to the mean GHQ-12 score ($F(4,471) = 2.471$, $p < 0.05$) and displayed a negative linear trend at the $p < 0.10$ level as the students progressed through the mini-transitions ($F(1,471) = 3.309$, $p < 0.10$) (Table 2 and Figure 4).

Differences between rotations

Within the dual learning year, students experienced their first, second, third or fourth mini-transition in different junior rotations. Junior rotations did not differ with respect to students' perceptions of their skills level ($F(3,385) = 0.371$, $p = \text{n.s.}$), GHQ-12 scores ($F(3,385) = 1.097$, $p = \text{n.s.}$) and GHQ-12 cases percentage ($\chi^2 = 0.686$, $df = 3$, $p = \text{n.s.}$).

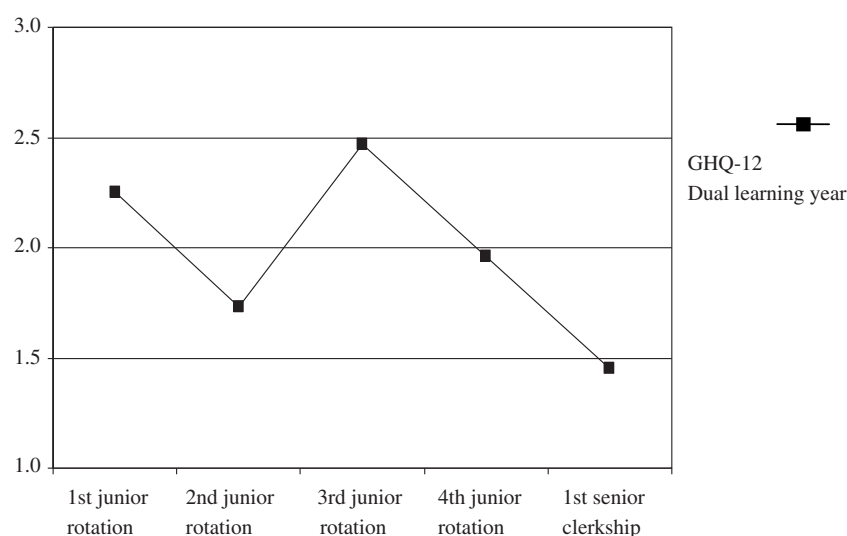


Figure 4. Mean score for GHQ-12. Dual learning year divided into mini-transitions.

Students in junior rotation A experienced significantly less workload than students in rotations B and C ($F(3,385) = 11.169, p < 0.001$).

Discussion and conclusions

In this study, we investigated the workload students experience, students' perceptions of their level of skills and students' stress in a dual learning year with just-in-time skills training, aimed at easing the transition from preclinical to clinical training. The results indicated that the workload students experienced and their stress levels decreased, and that their perceived level of skills increased as they progressed through the successive mini-transitions. Compared to a curriculum in which skills training was offered in the years preceding the clerkships, students in the dual learning year experienced less workload and their perception of their skills level was similar.

Compared to the baseline measurement, the students experienced less workload from the very start and over the whole dual learning year. However, the difference between the first mini-transition and the baseline measurement was very small and non-significant. Compared to the data of a previous study conducted at another university, the students who participated in the dual learning year experienced less workload (Prince et al. 2005). Since the high workload students experience has previously been indicated as the major transition difficulty, this is an important finding (van Hell et al. 2008). Our data show that by integrating the preparation and encounter phases as described in Nicholson's (1984) theory of 'work role transitions' and alternating just-in-time skills training and clerkships, students experience less workload. Because the skills are learnt right before the clerkship, they are easier to apply during the subsequent clerkship, enabling the students to direct more attention to other novelties they meet. Another explanation might be that since the students switch between the training environment and clerkships they have a better overview of their duties and responsibilities and are better able to deal with workload difficulties during the mini-transition.

In our dual learning year, skills training is concentrated in the first Master year. At the start of the first clerkship, the students who participated in the baseline measurement had received much more skills training than students in the dual learning year at the stage of their first mini-transition. Therefore, it not surprising that the latter perceived a lower level of skills. However, a score of 3.39 indicated that students in their first mini-transition still perceived a satisfying level of skills. Furthermore, once the students in the dual learning year were in their second mini-transition, they had made up the arrears. The finding that students perceived a satisfying level of skills even though they had not received all skills training can be explained by students' awareness that they are not expected to have mastered all clinical skills.

Previous studies have reported a great range in medical students' stress (Lloyd & Gartrell 1984; Firth 1986; Goldberg et al. 1997; Toews et al. 1997; Guthrie et al. 1998; Niemi & Vainiomäki 2006; Ross et al. 2006). The percentage of students experiencing psychiatric distress during the first mini-transition of the dual learning year (23.3 percent) corresponds to other medical education programmes (Firth 1986; Goldberg et al. 1997; Toews et al. 1997; Guthrie et al. 1998; Niemi & Vainiomäki 2006; Ross et al. 2006). These percentages are higher than in the general Dutch population, but lower than in a psychiatric patient population (Koeter & Ormel 1991). The negative linear trend ($p < 0.10$) in student stress scores indicates that as the students progress through the mini-transitions, their stress decreases. By the time the students had started their first senior clerkship, their stress had decreased significantly, with 13.8% of students scoring above threshold, which is comparable with that of the general Dutch population (Koeter & Ormel 1991). A benefit of our dual learning year is that students' stress levels decreased to a much lower level than the 15–35% percent reported in earlier studies in medical education (Firth 1986; Goldberg et al. 1997; Toews et al. 1997; Guthrie et al. 1998; Niemi & Vainiomäki 2006; Ross et al. 2006).

In the dual learning year, gender differences occurred for the workload students experienced, students' perceptions of their level of skills and students' stress. Females experienced

more stress than males, which is in line with the results of several previous studies (Lloyd & Gartrell 1984; Firth 1986; Goldberg et al. 1997; Toews et al. 1997; Guthrie et al. 1998; Niemi & Vainiomäki 2006). Furthermore, females experienced more workload and perceived a lower level of skills than males. The results of previous studies also showed that the transition may be more difficult for female than for male students (Hayes et al. 2004; Babaria et al. 2009). However, since no gender differences occurred in the baseline measurement (van Hell et al. 2008), it is possible that males benefit more from the dual learning year than females. Further research should be performed to provide more insight into the causes and effects of these gender differences in satisfaction with workload, satisfaction with skills levels and stress.

Since the students attended the four rotations in random order, we were able to examine the differences between rotations A, B, C and D, independently of whether it was the students' first, second, third or fourth mini-transition. We only found differences between rotations with respect to the workload students experienced. To ease the transition, we would prefer students to start in a clerkship with a relatively low experienced workload and increase this gradually. This would imply that all students should start their first clerkship in a medical speciality from rotation A, their second in a medical speciality from rotation D and continue their third and fourth clerkships in the medical specialities from rotation B or C. Future studies should examine (1) differences in perceived workload between the rotations, (2) whether students following the same rotation (A, B, C or D) perceive a relatively higher workload in specific medical specialities and (3) whether differences in perceived workload are caused by the workload students experience or by their actual working hours and clerkship activities.

A possible limitation of this study is that students' self-reports were used to determine transition difficulties. The influence of dual learning on the students' actual workload and skills levels remains unknown. However, student learning is influenced by their interpretation of the learning environment, rather than by the objective learning environment (Lowyck et al. 2004). Therefore, it is a rational choice to focus on transition difficulties as perceived by the students. A previous study at our university showed that students who participated in the baseline measurement worked 8.4 h a day on clerkship activities in the hospital (Van Hell 2009). Therefore, the nature of the high workload seems to refer more to students' perceptions of workload than to the actual hours they work. However, the influence of the dual learning year on students' skill acquisition should be subject of future research. The first strength of this study is the use of a balanced cross-sectional design in which the participating students were distributed evenly across the four mini-transitions and rotations. This design prevented that the same students had to participate in all five measurement moments of the dual learning year. Consequently, it prevented questionnaire fatigue among students, which might negatively influence the measurements. On the other hand, this choice implies that the gathered data are not purely longitudinal. A second strength is that we used the same instrument to measure the workload students experienced and students' perceptions of their levels

of skills in the dual learning year and in the baseline measurement. We were thus able to explore the dual learning year and make a comparison with the former curriculum. Furthermore, the reliability of the scales used was acceptable, and computed correlations were all significant and in the expected direction. These arguments contribute to the reliability and validity of the presented findings.

It was somewhat difficult to agree upon an exact point in time on which the baseline measurement and the dual learning year should be compared. The baseline measurement was performed in a curriculum having one transition (after 10 trimesters of pre-clinical training). Therefore, the two scales from the transition questionnaire could only be completed once by these students and the measurements were taken at a single point in time. In the dual learning programme, students experienced several mini-transitions which resulted in an overview of the whole year. To compare the dual learning year and the baseline measurement, three different points in time can be put forward: (1) at the first mini-transition of the dual learning year, because both groups start their clinical training period at this point in time; (2) at the second mini-transition of the dual learning year, because both groups have followed 10 trimesters of medical training; (3) at the beginning of the first senior clerkship after the dual learning year, because the same amount of skills training was provided to both groups of students. Because each point in time is justifiable to compare the dual learning year and the baseline measurement, all data are presented in this study. In all three cases, the dual learning year seems to have advantages compared to the baseline measurement. However, a longitudinal measure of students' general stress levels during the first clinical year of the previous curriculum might have provided more useful data for comparing both curricula. On the other hand, these data would have limited value because the students of the former curriculum faced only one major transition.

Previous studies have already described local curriculum changes aimed at decreasing transfer difficulties, such as implementing professional skills and communication training, medical skills laboratory, transitional courses and transitional clerkships (van Dalen & O'Brien 2002; Mainhard et al. 2004; Jacobs et al. 2005; Peeraer et al. 2007; Poncelet et al. 2008; Chittenden et al. 2009). It would be useful to compare different curriculum changes and investigate whether the perceived difficulty of the transition differs between these curricula. As far as we know, a curriculum reform specifically aimed at easing the transition does not yet exist. We implemented a dual learning year in which students receive just-in-time skills training to ease the transition from preclinical to clinical training. A comparison of the results of our study with those of a baseline measurement from a former curriculum, and earlier studies on transition difficulties in medical education, showed that dual learning in which skills training and clerkships alternate is a promising innovation to ease the transition.

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Ethical approval

In accordance with national practice in the country in which these studies were carried out, ethical approval is not required for educational studies and surveys. However, we can confirm that participants cannot be identified from the material presented and that no plausible harms to participating individuals arise from the study.

Notes on contributors

ELISABETH A. VAN HELL, PhD, is an Educationalist, Center for Research and Innovation in Medical Education, University of Groningen and University Medical Center Groningen, The Netherlands.

JAN B.M. KUKS, MD, PhD, is a neurologist, Professor of Medical Education, Department of Neurology and Institute for Medical Education, University of Groningen and University Medical Center Groningen, The Netherlands.

JAN C.C. BORLEFFS MD, PhD, is an internist, Professor of Medical Education and Dean of Education at the University Medical Center Groningen and University of Groningen, The Netherlands.

JANKE COHEN-SCHOTANUS, PhD, is a Professor of Medical Education and Head of the Center for Research and Innovation in Medical Education, University of Groningen and University Medical Center Groningen, The Netherlands.

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